Draft
Sampling and Analysis Plan

Additional Chemical Characterization of Sediments along Berths 240X, Y, and Z

Port of Los Angeles
Los Angeles, California

Prepared For:

Port of Los Angeles
Environmental Management
425 South Palos Verdes Street
San Pedro, California, 90731

March 2010

WESTON SOLUTIONS

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ACRONYMS AND ABBREVIATIONS

APHA	American Public Health Association
CA LRM	California Logistic Regression Model
CDF	confined disposal facility
COC	chain-of-custody
CSI	Chemical Score Index
CSTF	Contaminated Sediments Task Force
CVAAS	cold vapor atomic absorption spectrometry
DDT	dichlorodiphenyltrichloroethane
DGPS	Differential Global Positioning System
DTSC	Department of Toxic Substances Control
ER-L	effects range–low
ER-M	effects range–median
GC/ECD	gas chromatography/electron capture detection
GC/MS	gas chromatography/mass spectrometry
GIS	geographic information system
HERD	Human and Ecological Risk Division
ICP/MS	inductively coupled plasma/mass spectrometry
ID	identification
LOE	line of evidence
MLLW	mean lower low water
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
POLA	Port of Los Angeles
QA	quality assurance
QAP	quality assurance plan
QC	quality control
RIW	remedial investigation workplan
SAP	sampling and analysis plan
SCUBA	self-contained underwater breathing apparatus
SGI	The Source Group, Inc.
SIM	selective ion monitoring
SM	standard methods
SOP	standard operating procedure
SQO	sediment quality objective
SWM	Southwest Marine
TBT	tributyltin
TOC	total organic carbon
TPH	total petroleum hydrocarbon
TTLC	total threshold limit concentration
USCS	Unified Soil Classification System
USEPA	United States Environmental Protection Agency
VSP	Visual Sampling Plan
WESTON	Weston Solutions, Inc.
WGS 84	World Geodetic System 1984

UNITS OF MEASURE

cm	centimeter
Cy	cubic yards
°C	degrees Celsius
ft	feet or foot
L	liter
µg/kg	microgram per kilogram
µg/L	microgram per liter
mm	millimeter
m	meter
mg/kg	milligram per kilogram
mL	milliliter
%	percent

1.0 INTRODUCTION

1.1 Background and History

At the request of the Department of Toxic Substances Control (DTSC), the Port of Los Angeles (POLA) proposes to conduct an additional sediment investigation along and adjacent to Berths 240X, Y, and Z to determine what nexus exists between the land and water-side contamination and to further delineate the extent of vertical and horizontal sediment contamination in the area. Berths 240X, Y, and Z are part of the former Southwest Marine (SWM) leasehold property on Terminal Island in POLA. SWM leased this property in POLA from 1981-2005 for the operation of a ship repair, retrofit, and demolition business. Prior to 1981, the property was occupied by Southwest Shipbuilding Company (1918-1921) and Bethlehem Shipbuilding Corporations, Ltd. (1921-1981). The leasehold area was divided into six parcels, and three of these parcels included waterways. Parcel 4 was predominantly covered by water, and contained two large dry docks, while Parcel 5 and 6 were narrow stretches of land along Berths 240X, Y, and Z.

This study is focused on the delineation of sediment contamination in areas that were not recently dredged. Dredging of sediment in the vicinity of the former SWM leasehold area has occurred as part of two major projects. The most recent dredging was at Berth 240B, which is located adjacent to the Exxon Mobil tank farm across the Berth 240 slip from the SWM site (Figure 1). Approximately 6,500 cubic yards (cy) of sediment was dredged from the Berth 240B area (to a depth of -37 to -39 feet [ft] mean lower low water [MLLW]) in July 2006 and taken to POLA's approved upland disposal site at Anchorage Road. Also, during the period from 2004-2006, the main channel adjacent to the former SWM facility was dredged to -53 ft MLLW as part of POLA's comprehensive Channel Deepening project (Figure 1). No additional dredging has occurred in the vicinity of the former SWM site since before 1990.

POLA has an approved plan to fill the dry dock slips (within Parcel 4) as part of the next phase of the Channel Deepening project to create a confined disposal facility (CDF). This will result in the creation of 8 acres of new land for future port-related use. Construction of the CDF will also result in capping of existing contamination in the slips. In addition, the CDF will accommodate placement of additional low level contaminated sediments, to be dredged as part of the Channel Deepening, which have been characterized as unsuitable for open water disposal. Containment structure construction for the CDF will require dredging of the area between the containment structure and the existing limit of the -53 ft MLLW channel (Figure 1). This material will also be placed in the CDF.

Based on POLA's plan to fill Parcel 4 (former dry dock slips) in conjunction with the Channel Deepening project, the current sediment investigation is focused only on characterization of sediment adjacent to Parcels 5 and 6 (Berths 240X, Y, and Z) and within Slip 240. This project was designed to assess data gaps, based on previous sampling and analysis conducted in Slip 240, as discussed in Section 1.2 below, and in accordance with recommendations from the DTSC, Human and Ecological Risk Division (HERD). A Remedial Investigation Workplan (RIW) for the former SWM Facility (985 Seaside Avenue, Terminal Island, California), prepared by the Source Group, Inc. (SGI) for POLA, was submitted to the DTSC on March 19, 2009. HERD reviewed the workplan on May 14, 2009 and for the waterside portion of the workplan, HERD recommended that additional information be collected to assess the relationship between landside and waterside contamination, with the ultimate goal being the determination of ecological risk at the site. As part of subsequent meeting on May 18, 2009 between and POLA and HERD, it was agreed that POLA would prepare a sampling and analysis plan (SAP) for purposes of further characterizing sediment contamination along Berths 240 X, Y, and Z. A draft SAP (submitted on June 11, 2009) was reviewed by HERD and comments provided to POLA on August 19, 2009. DTSC requested that in addition to characterizing the area immediately adjacent to Berths X, Y, and Z, and assessing the nexus between landside and waterside contamination, that additional samples should be placed on the other side of Slip 240 such that the extent of contamination in the slip could be fully investigated. It was also determined that additional testing for polycyclic aromatic hydrocarbons (PAHs) would be conducted at all stations investigated. In addition to HERD's comments, the Contaminated Sediments Task Force (CSTF) was engaged at this stage of the project, given their routine involvement with sediment contamination issues in the region. Consequently, POLA presented a revised SAP at the CSTF meeting on September 23, 2009 that addressed earlier comments from HERD. At this meeting, CSTF members raised questions regarding sample density and placement of station locations. To address these questions, POLA performed additional analysis to establish the appropriate sample number and suggested placement locations for characterization of the project area and presented the results of this analysis and the revised sampling locations at the January 27, 2009 CSTF meeting (details are provided in Section 1.4). This SAP reflects results of the CSTF discussions in regard to sample density and placement location.

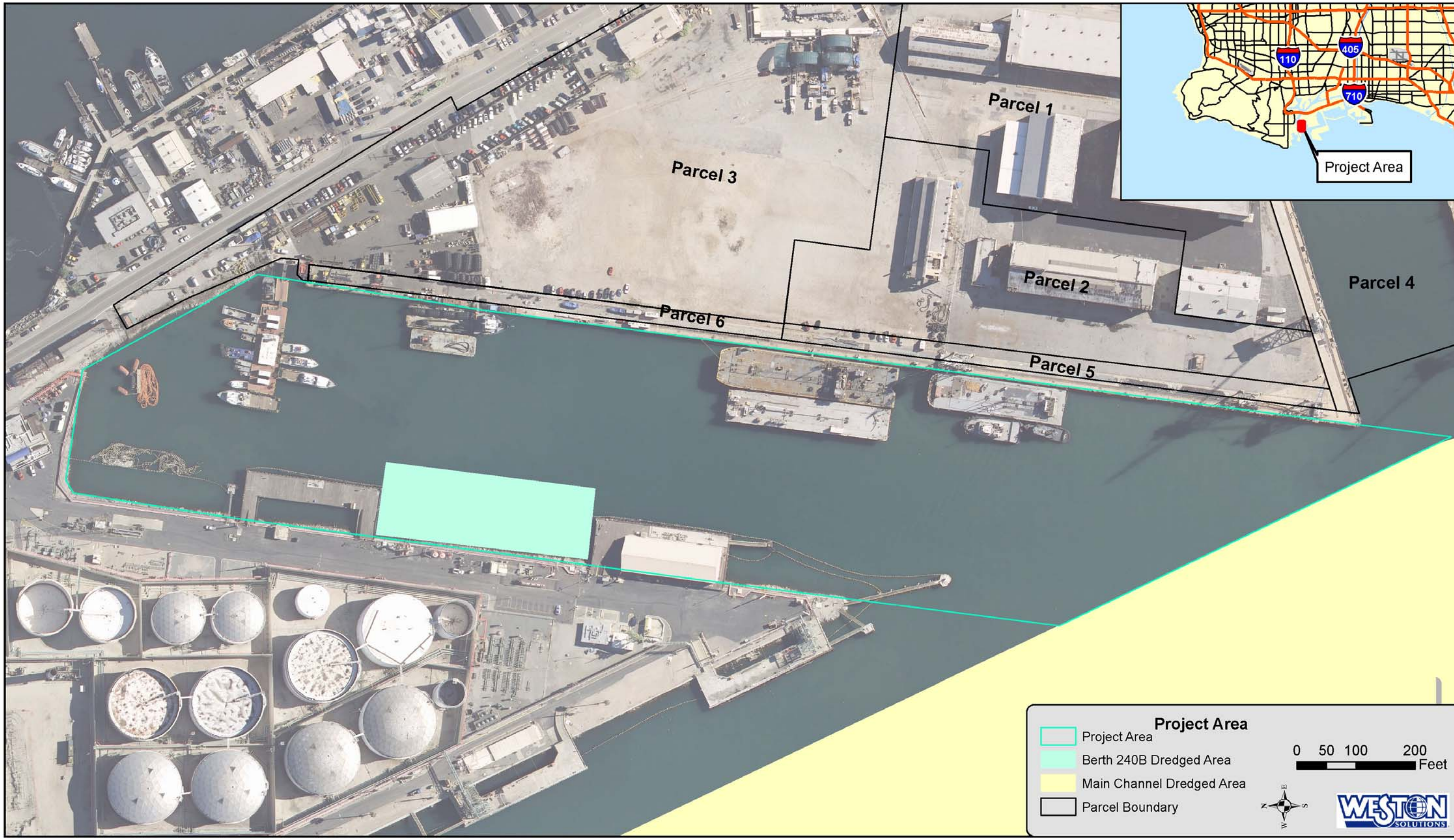


Figure 1. Project Area Along Berths 240X, Y, and Z, Port of Los Angeles

1.2 Previous Studies

Previous environmental studies have been conducted in the former SWM leasehold area, for both the landside and waterside areas. An overview of the landside studies are provided below followed by a more detailed review of previous sediment investigations.

For the landside portion of the leasehold, the most recent studies found elevated levels of total petroleum hydrocarbons (TPH), polychlorinated biphenyls (PCBs), and metals (i.e., lead, copper, and chromium) in soil and/or groundwater at select locations within the leasehold (SGI, 2007; Figure 2). TPH was elevated in soil (>1,000 milligram per kilogram [mg/kg]) and groundwater (>1,000 microgram per liter [µg/L]) near the former diesel tank on the north end of Parcel 1, in soil at the former abrasive blasting grit containment area on the south end of Parcel 1, and in soil and groundwater near former oil storage areas within Parcel 2. PCBs were elevated (>6.2 mg/kg) in soil on the west side of Parcel 3 and in one small area within the northwest portion of Parcel 2. Additionally, while recent studies detected very low concentrations of tributyltin (TBT) in soil (0.0008- 0.009 mg/kg), a previous study measured TBT soil concentrations as high as 55 mg/kg in the central portion of Parcel 2.

On the waterside portion of the leasehold, SWM analyzed three sediment samples collected at the ends of Piers 1, 2, and 3 within Parcel 4 in 2002 for arsenic, chromium, copper, nickel, lead, zinc, and total organic carbon (TOC). All metal concentrations were below their respective effects range-median (ER-M) values suggestive of a low probability of potential toxicity to benthic biota. However, the study was intended as an initial reconnaissance and was not designed to delineate spatial distribution at the site. In addition, organic contaminants were not investigated as part of SWM's 2002 investigation. Consequently, the POLA requested that Weston Solutions, Inc. (WESTON) evaluate the spatial (horizontal and vertical) distribution of sediment contamination within and adjacent to the SWM leasehold area (Figure 3). Results of this study indicated that there were elevated concentrations of a number of sediment-associated contaminants within and adjacent to the SWM leasehold area (WESTON, 2005). Data from the 2005 investigation were interpolated using an inverse distance weighted geographic information system (GIS) method, and a series of maps were generated to illustrate the spatial distribution of elevated sediment-associated contamination within the leasehold (i.e., based on comparisons to total threshold limit concentration [TTLC] exceedances, ER-M exceedances, and exceedances of the Long Beach Naval Station copper cleanup goals) (WESTON, 2006). The data interpolation had limited confidence due to the large distances between sediment station locations within and adjacent to the SWM leasehold area. It was determined that additional sediment sampling and characterization was necessary to obtain higher resolution in the mapping of sediment contaminant distributions and areas and volumes of material requiring remediation using spatial interpolation techniques, to further refine the spatial extent of contamination.

In 2007, WESTON collected 20 additional sediment core samples within Parcel 4 of the SWM leasehold area and 26 additional sediment core samples along the wharf-face of Parcels 5 and 6 and offshore of Parcel 4 (Figure 4) (WESTON, 2007). Parcels 5 and 6 are narrow stretches of land along Berths 240X, Y, and Z; therefore, stations adjacent to Parcel 5 and 6 are in the vicinity of the sampling area for this project. Fifteen stations (SWM45 – SWM59) were located adjacent to Parcel 5. Stations adjacent to Parcel 5 demonstrating the highest concentrations of contaminants included SWM49 – SWM53. In this area, there were multiple metals (copper, lead, mercury, and zinc) that exceeded ER-M values at multiple depths. At a few depth intervals, there were TTLC exceedances for lead, mercury, and zinc. The only organochlorine pesticide detected was the dichlorodiphenyltrichloroethane (DDT) derivative, 4,4'-DDE, which exceeded its ER-M at six of the 15 stations in this area. TBT and other organotins were also detected adjacent to Parcel 5 with six stations demonstrating TBT concentrations above 100 micrograms per kilogram (µg/kg). Seven stations (SWM40, SWM60 – SWM65) were located adjacent to Parcel 6. At four of the seven stations in this area (SWM40, SWM62, SWM64 and SWM65), the concentrations of several metals (copper, lead, mercury and zinc) consistently exceeded ER-M values in the surface and multiple depth intervals. In addition, several depth intervals demonstrated TTLC exceedances for mercury and lead. The only organochlorine pesticides detected were the DDT derivatives, 4,4'-DDD and 4,4'-DDE. 4,4'-DDE exceeded its ER-M value at four stations in this area. TBT was elevated above 100 µg/kg at five of seven stations in this area.

PCB congeners were not initially analyzed in these samples; however, because of subsequent concern regarding a potential link between landside PCB contamination (SGI, 2007), archived surface (0-2 ft) core segments were recently analyzed for PCB congeners at stations SWM40, SWM52, SWM54, SWM59, and SWM61 - SWM65. Results indicated that concentrations of total PCB congeners were below the effects range-low (ER-L) value at SWM59 and below ER-M value at SWM61. Total PCB congeners were significantly elevated above ER-M values at stations SWM62-SWM65 (2-3 times higher than ER-M) and at station SWM 40, SWM52, and SWM54 (4 – 11 times higher than ER-M).

1.3 Sampling and Testing Objectives

The objectives of this study are to:

- Further delineate the spatial (horizontal and vertical) distribution of sediment contamination along Berths 240X, Y, and Z and within the entire Slip 240 area;
- Determine whether landside contamination has impacted sediment quality on the adjacent waterside portion of Berths 240X, Y, and Z.

1.4 Selection of Station Locations

Two key strategies were used to select station locations in this study: (1) to delineate contamination in areas within Slip 240 with data gaps based on previous studies conducted by WESTON (2005, 2007); (2) to investigate a linkage to landside contamination by sampling near storm drain outfalls and under the wharf face along Berth 240 X, Y, Z.

1.4.1 Data Gaps

1.4.1.1 Previously Unsampled Areas

To assess sediment contamination within Slip 240 in areas that have not been sampled, sediment cores will be collected in areas where there are currently no data (i.e., select locations within the slip to provide for greater spatial coverage, at the north end of the wharf face, and in the area between the slip and the main channel dredged area) (Figure 5). These data will then be combined with results from the 2005 and 2007 studies to provide higher resolution in the mapping of sediment contaminant distributions using spatial interpolation techniques. The total number of stations from which sediment chemistry will be used in spatial interpolations upon completion of this study is 52.

Because of the concerns raised at the September 23, 2009 CSTF meeting in regard to sample density and coverage in POLA's draft SAP for Berth 240 Slip, sample density and placement were statistically evaluated using the U.S. Environmental Protection Agency (USEPA)-recommended software called Visual Sampling Plan (VSP), version 5.4.2, (Battelle Memorial Institute), a data quality objectives-based systematic planning software that uses statistics to best determine the number and location of samples/transects. Prior to using this program, GIS was used to determine that the size of the Berth 240 slip area to be sampled and characterized for sediment contamination was approximately 512,000 ft^2, not including the area recently dredged at Berth 240B, the two floating docks adjacent to Berth 240B, and the area immediately along the wharf face in which large numbers of samples have already been collected.

Then, using the VSP, a range of sample sizes were estimated by varying the probabilities (i.e., 85% to 95% confidence) of hitting a hot spot in the Slip 240 area, based on different sized hotspots (5, 7.5, and 10% of the Slip 240 Area were used). Assumptions for this analysis included that the shape of the sampling grid would be triangular (typically used grid), the samples would be collected by vibracore, and the hot spot would be circular in shape. Results of the VSP sample size estimation procedure are shown in Table 1 below. Maps displaying the spatial arrangement of sampling locations in a systematic triangular grid are shown in Appendix A.

Table 1. Determination of Sample Size to Characterize Slip 240 for Sediment Contamination, Based on a Systematic Triangular Grid Sample Placement

	Hot Spot Size (Percent of Slip 240 Area)		
Probability of Finding a Hot Spot	**5%**	**7.5%**	**10%**
85%	18	12	9
90%	19	13	10
95%	21	14	11

Overall results indicate that varying the hot spot size affects the sample size result more significantly than varying the probability of finding a hotspot. Results also indicate that a sample size of 21, using a systematic triangular grid sampling design, has a 95% probability of finding a hotspot in Slip 240, given a hotspot that represents 5% of the total area of the slip. Based on these findings, it was agreed at the CSTF meeting on January 27, 2010 that 21 sampling locations across the slip would be a reasonable number for purposes of characterizing sediment contamination in Slip 240. As a consequence, in addition to the four previously characterized stations (20-23) within Slip 240, a total of 22 new stations will be analyzed for sediment contamination in the Slip. Based on the discussion at the January 27, 2010 CSTF meeting, two of these stations have been placed in the area between the edge of Slip 240 and the Main Channel Dredged Area.

In addition to concerns about sample density, a question was also raised at the January 27, 2010 CSTF meeting in regard to the placement of stations in areas where there is shoaling. As a consequence, it was agreed that POLA would review station locations in relationship to bathymetry data and move station locations to areas in which there were shoals. Station locations have been reviewed and moved accordingly as shown in relationship to bathymetry in Figure 6 and Figure 7.

1.4.1.2 Previously Sampled Stations to be Resampled and Analyzed

As part of this investigation, archived core horizons from five stations previously sampled in 2007 will be submitted for chemical analysis in order to determine the vertical extent of contamination at each station. If archived core horizons are not available or in good condition for chemical analysis, sediment cores will be recollected from the five stations previously sampled in 2007. These stations include SWM40, SWM49, SWM50, SWM53, and SWM65. In 2007, subsurface contamination was measured at these stations; however, the maximum depth of contamination was not finalized (WESTON, 2007). Specifically, for three stations (SWM40, SWM53, and SWM65), elevated concentrations of metals and/or pesticides were measured in the deepest core segment analyzed (8-10 ft); thus, an additional archived core horizon (10-12/13) ft will be analyzed to determine if there is contamination at this depth. For the other two stations (SWM49 and SWM50), elevated concentrations of metals and/or pesticides were measured in the 6-8 ft core segment but not in the 12-14 ft core segment. Thus, core horizons from 8-10 ft and 10-12 ft will be sequentially analyzed to determine the maximum depth of contamination.

In addition, two stations previously sampled in 2005 (SWM20 and SWM22) and one station previously sampled in 2007 (SWM64) will be recollected in order to determine the vertical extent of contamination at each station. Subsurface contamination was measured at the deepest horizon collected and therefore the maximum depth of contamination was not finalized (WESTON, 2005 and 2007). Specifically, for stations SWM20 and SWM22, elevated concentrations of metals, pesticides, and/or PAHs were measured in the deepest core segment analyzed (4-6 ft and 2-5 ft, respectively). For station SWM64, elevated concentrations of metals were measured in the deepest core segment analyzed (10-12 ft). These stations will be recollected to the maximum depth achievable. During the initial sample collection, refusal was encountered at all three locations. If refusal is encountered during the current project after multiple attempts and slight adjustments, it will be assumed that refusal is due to large debris in the area and additional cores will not be attempted. Sample locations of the previously sampled stations proposed for resampling are provided in Figure 5.

1.4.2 Potential Landside-Waterside Contamination Nexus

1.4.2.1 Stations Near Storm Drain Outfalls

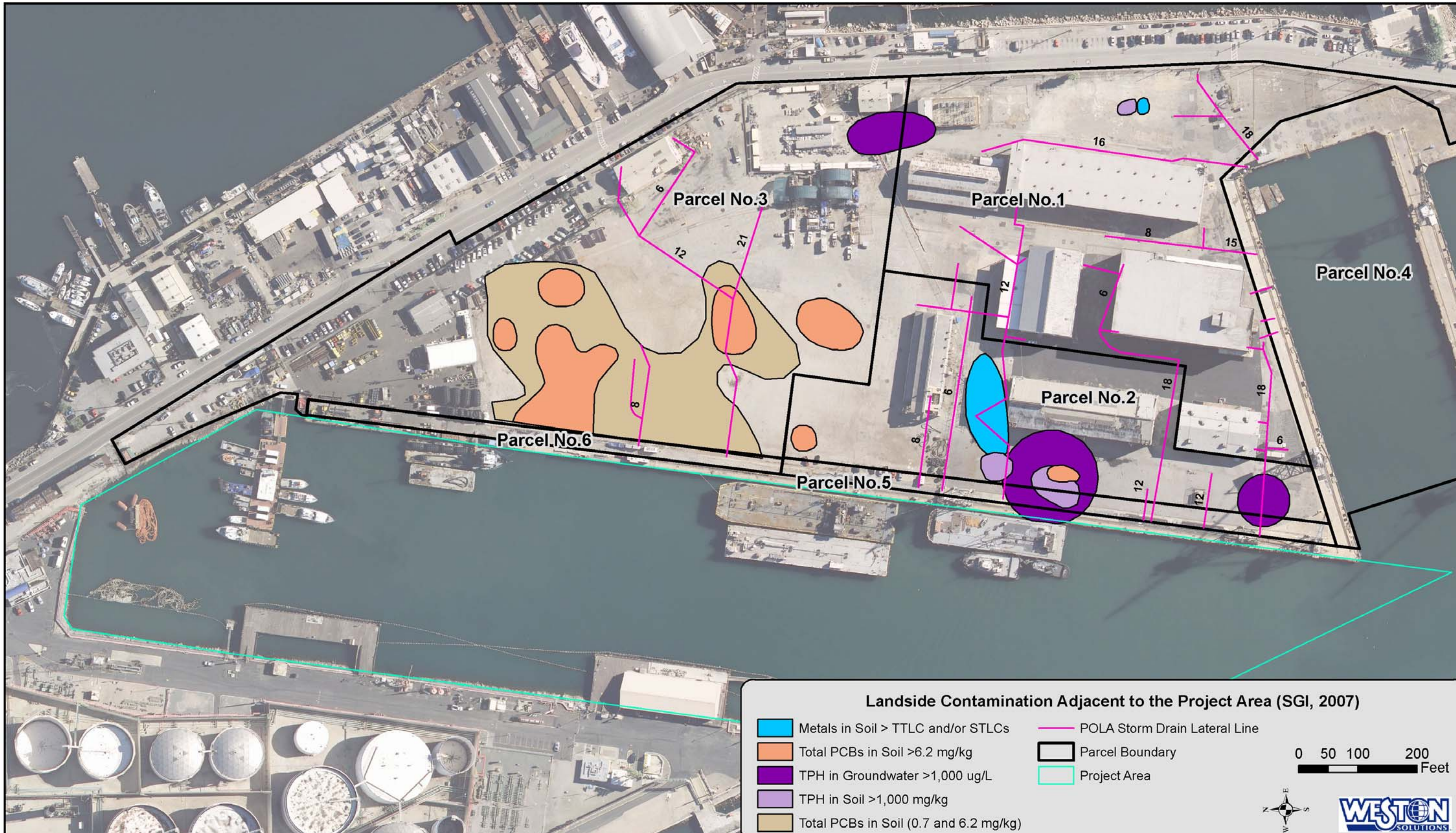
Sediment cores will be collected at four stations near storm drain outfalls along Berths 240X, Y, and Z. The objective of sampling at these stations is to investigate the relationship between known landside contamination and to sediment contamination near, and at increasing distance away from the outfall. Two outfalls were selected based on their proximity to metal, PCB, and TPH landside contamination as shown in Figure 2 below (SGI, 2007). These two outfalls were also selected based on recent analyses of PCB congeners at stations sampled and archived in 2007; results indicated low concentrations of total PCBs at stations SWM59 and SWM 61, but elevated concentrations at stations SWM40, SWM52, SWM54, and SWM62-SWM65 as described in Section 1.2. Stations were placed within 50 ft and/or 100 ft of the storm drain outfall. Results will be analyzed by performing statistical correlations to determine the relationship between concentrations of each analyte vs. distance from each storm drain. This will be performed at each outfall individually and results of multiple storm drains may be combined if relevant. Sample locations adjacent to storm drain outfalls are provided in Figure 8.

1.4.2.2 Stations Under the Wharf

During previous sediment characterization studies along Berths 240X, Y, and Z, sampling was focused on determining the spatial extent of sediment contamination in the area adjacent to the wharf. However, there is an area under the wharf (and essentially overlying the slope of crushed rock) that may provide information regarding potential linkage to landside contamination (Figure 10). Specifically, this area might be affected by groundwater leachate through sediment or crushed rock below the wharf, non-point source runoff from the wharf surface, or runoff directly from the storm drain outfall. For this study, diver collected push cores will be used to collect surface sediment (up to 2 ft) at three stations (SWM88, SWM89, and SWM90) under the wharf or as close to the wharf face as possible. Based on historical as-built drawings from POLA, crushed stone was placed on the slope leading away from the wharf face in the southern most area along Berths 240X, Y, and Z. For the station placed in this location (SWM88), samples will be collected at the edge of the crushed stone as close to the wharf face as possible. For the remaining two stations (SWM89, SWM90), samples will be collected directly under the wharf at the edge of the wharf face, where it is expected that the material is a sandy-silt. Two of the three diver core stations are also located near storm drain outfalls (SWM89, SWM90). Sample locations collected by diver core are provided in Figure 8.

1.4.3 Summary of Proposed Sampling Locations

Figure 9 shows all of the proposed station locations for this project. Specifically, the proposed stations to assess sediment chemistry data gaps within Slip 240 and Along Berths 240 X, Y, and Z together with the proposed station locations for assessing the potential link between landside and sediment contamination along Berths 240 X, Y, and Z are shown.



File: \\Fscca02\Warehouse\GIS\California\Los_Angeles_County\13340_Port_of_Los_Angeles\006_SouthWest_Marine\2010\mxds\PA_DA_landside_contaminant.mxd, 24-Feb-10 15:41, tydlaskm

Figure 2. Landside Contamination (SGI, 2007) in Relationship to the Project Area: Berths 240X, Y, and Z, Port of Los Angeles

Figure 3. Stations Sampled in 2005 to Assess Sediment Chemical Concentrations Adjacent to Berths 240X, Y, and Z, Port of Los Angeles

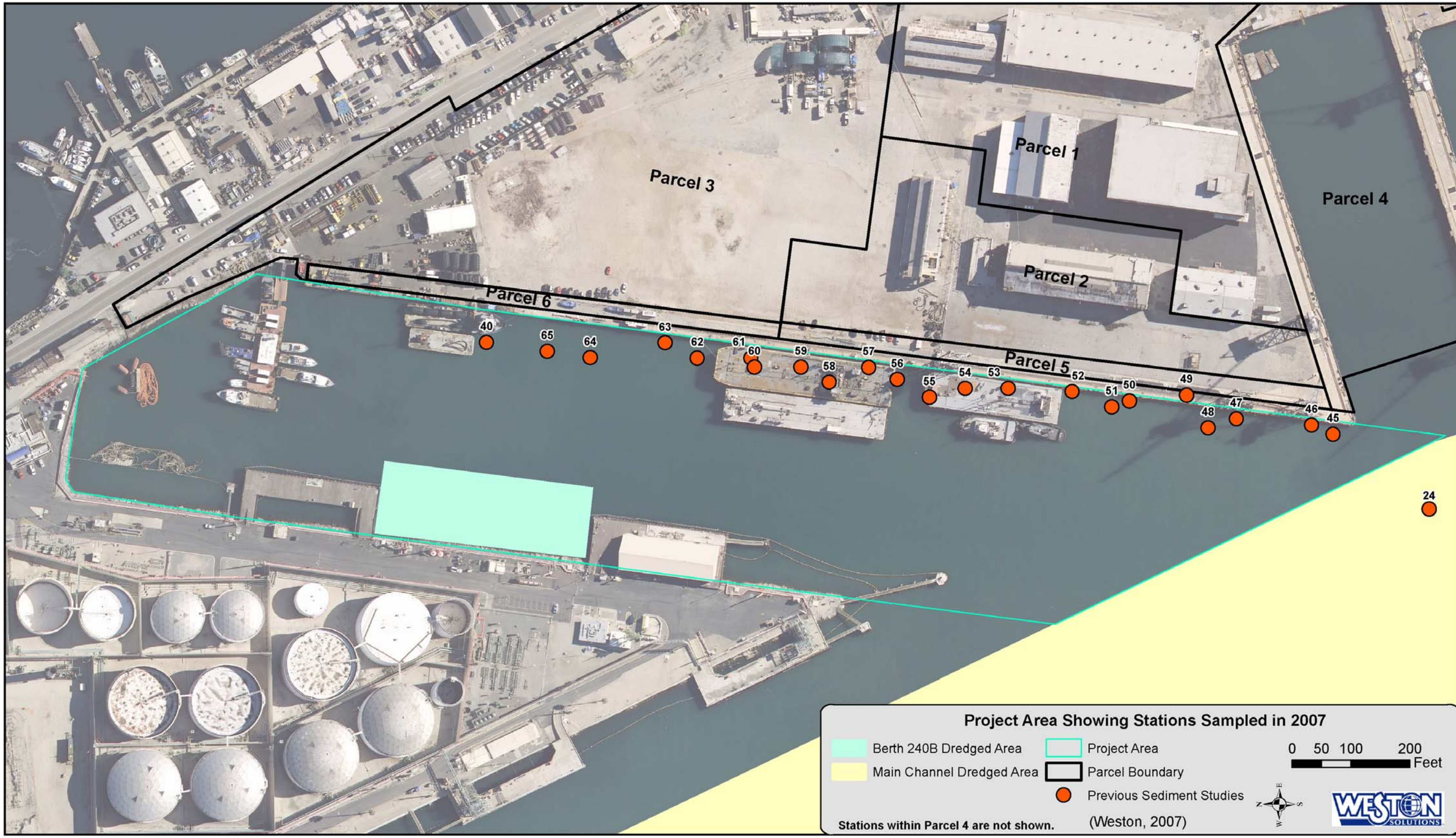


Figure 4. Stations Sampled in 2007 to Assess Sediment Chemical Concentrations Adjacent to Berths 240X, Y, and Z, Port of Los Angeles

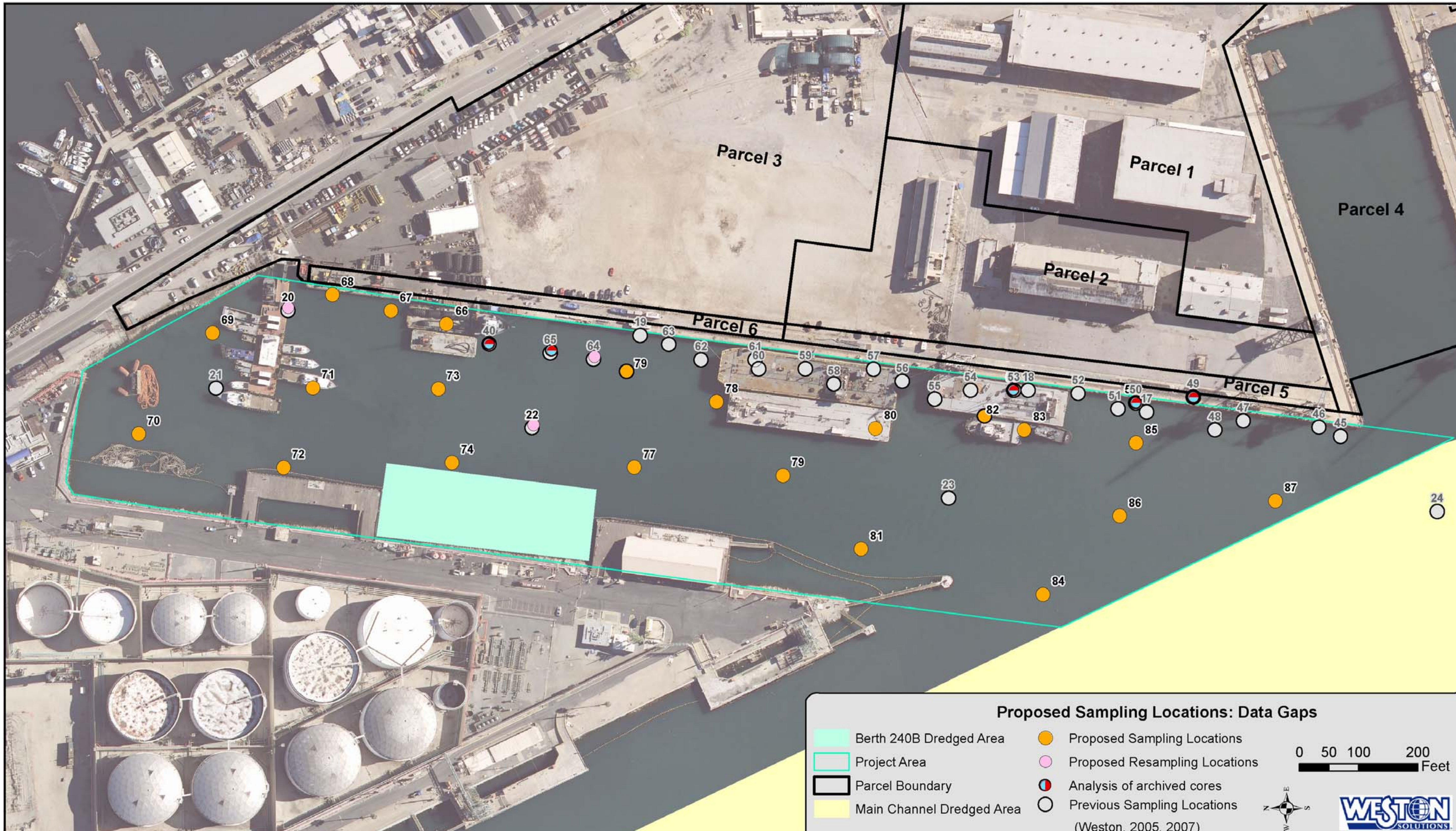


Figure 5. Proposed Station Locations to Assess Sediment Chemistry Data Gaps Adjacent to Berths 240X, Y, and Z and Within Slip 240, Port of Los Angeles

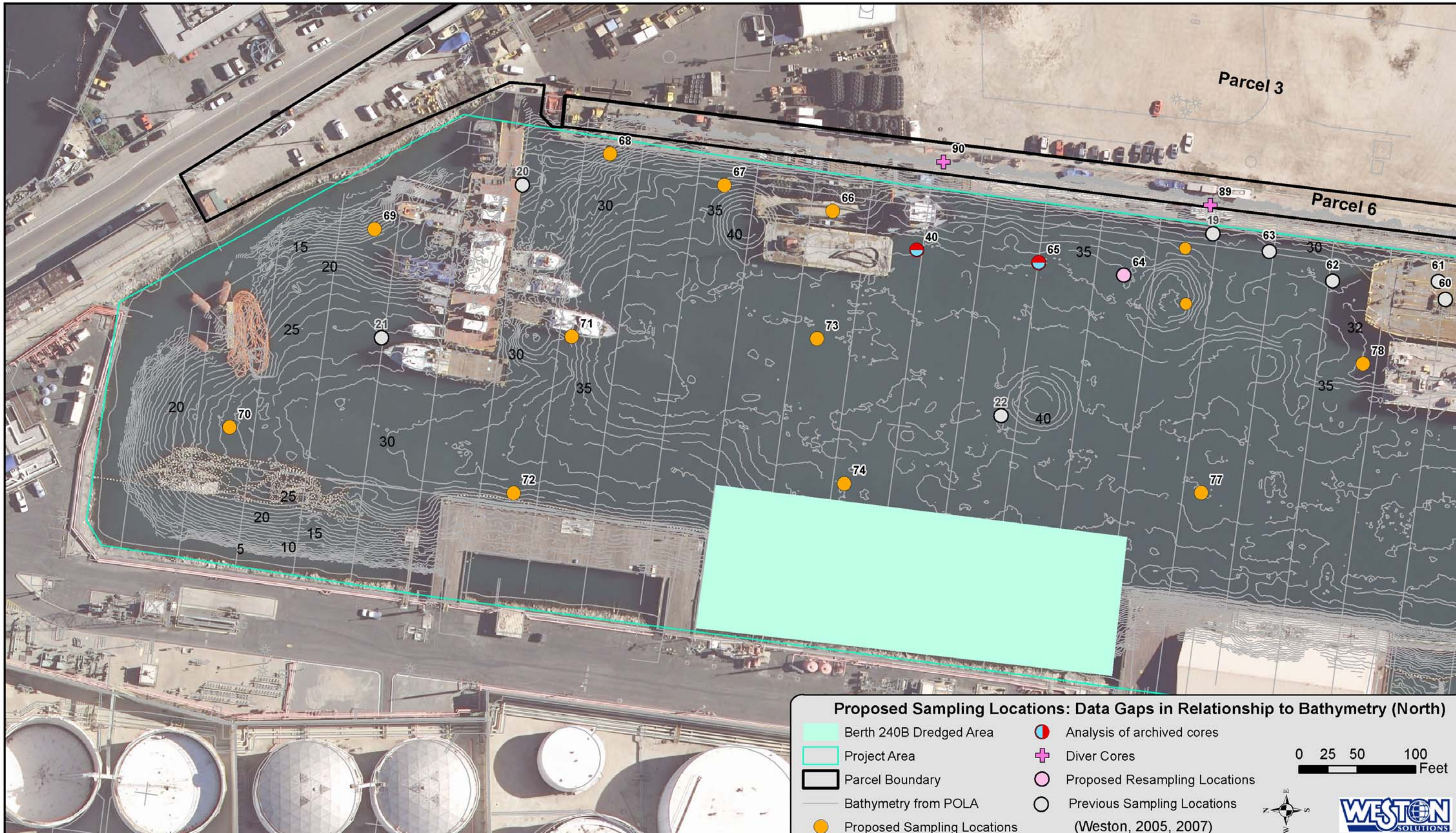


Figure 6. Proposed Station Locations to Assess Sediment Chemistry Data Gaps on the North Side of Slip 240, Port of Los Angeles, in Relationship to Bathymetry in the Project Area

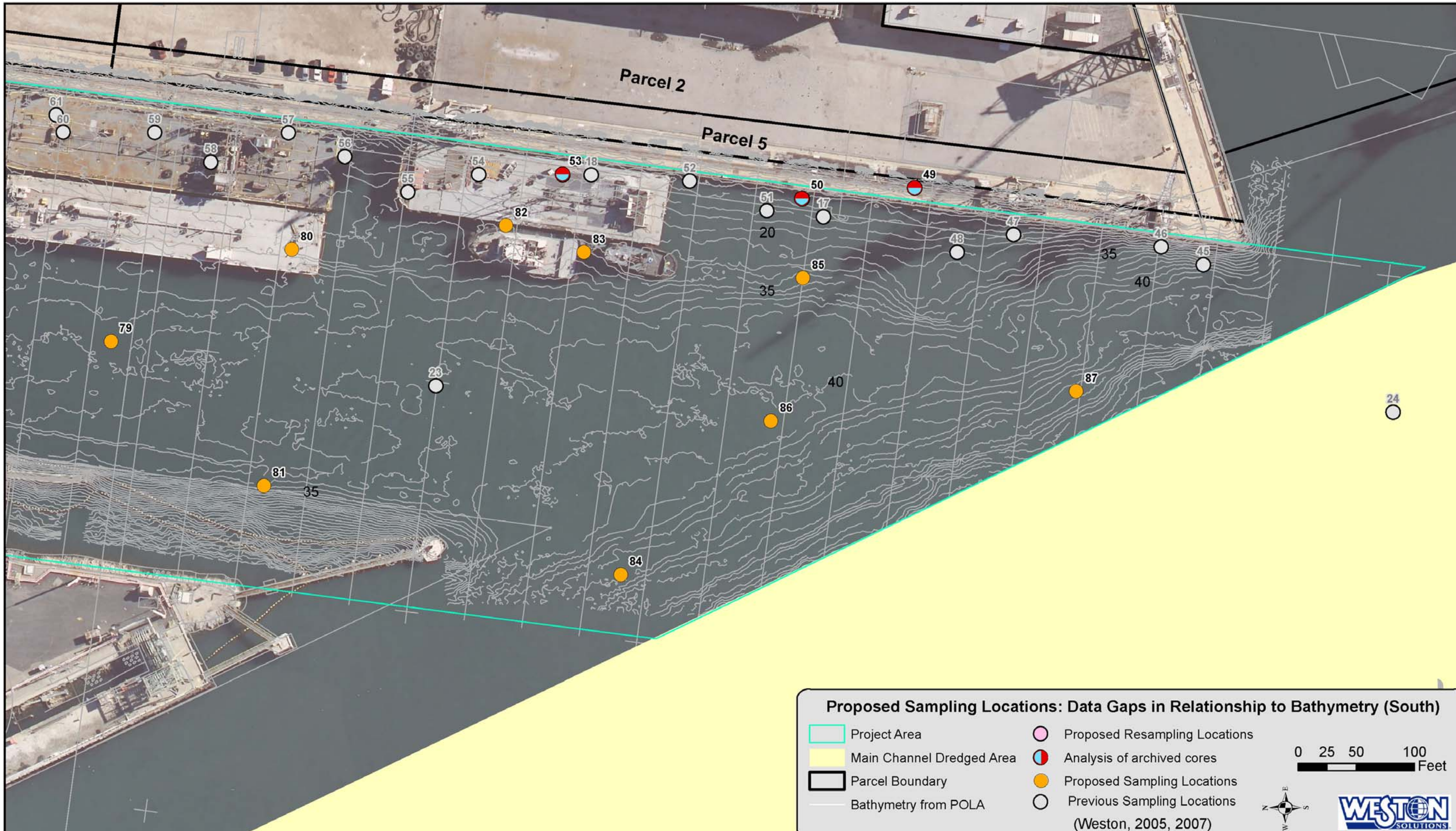


Figure 7. Proposed Station Locations to Assess Sediment Chemistry Data Gaps on the South Side of Slip 240, Port of Los Angeles, in Relationship to Bathymetry in the Project Area

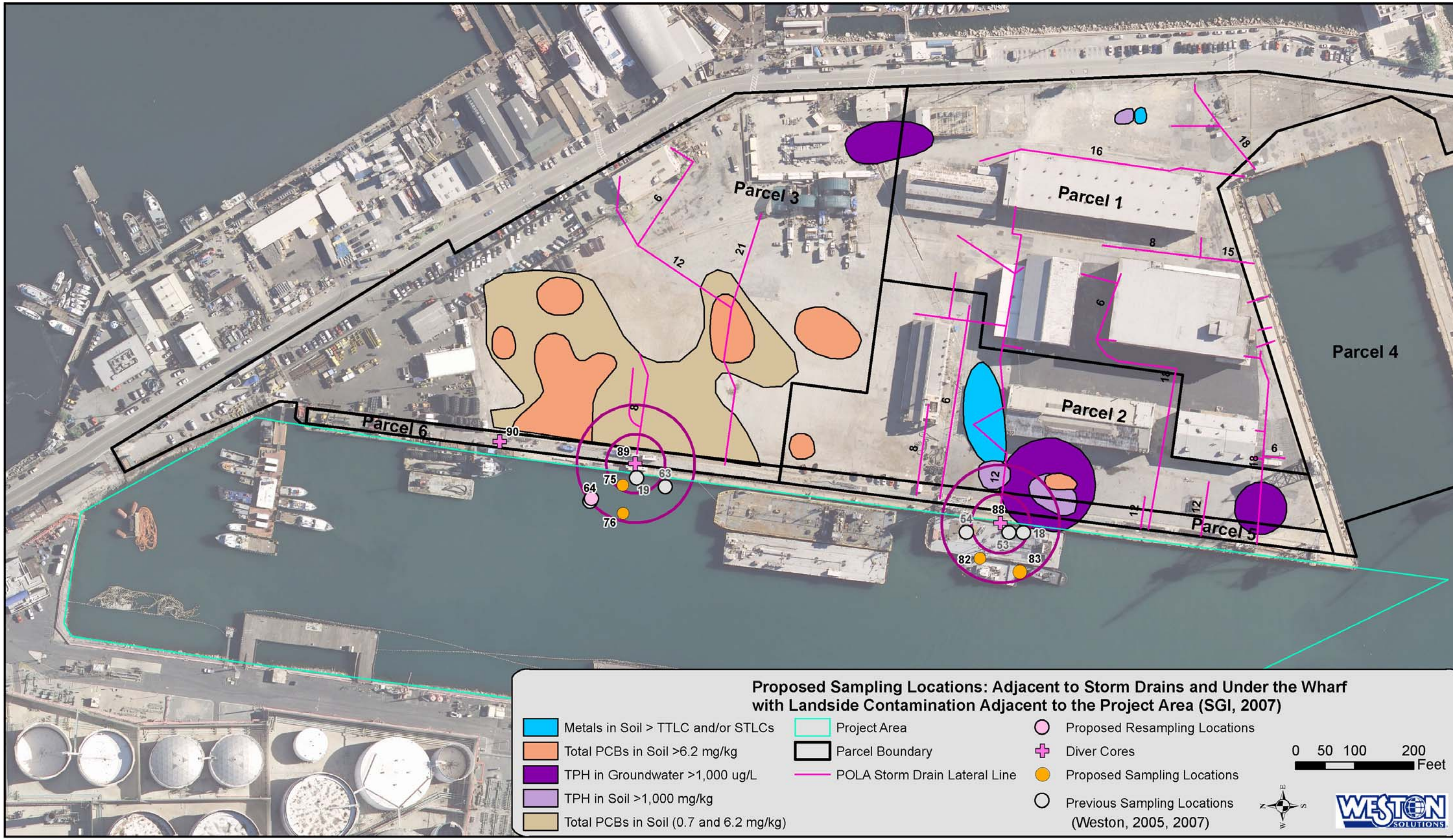


Figure 8. Proposed Station Locations Adjacent to Storm Drains and Under the Wharf Adjacent to Berths 240 X, Y, and Z, Port of Los Angeles

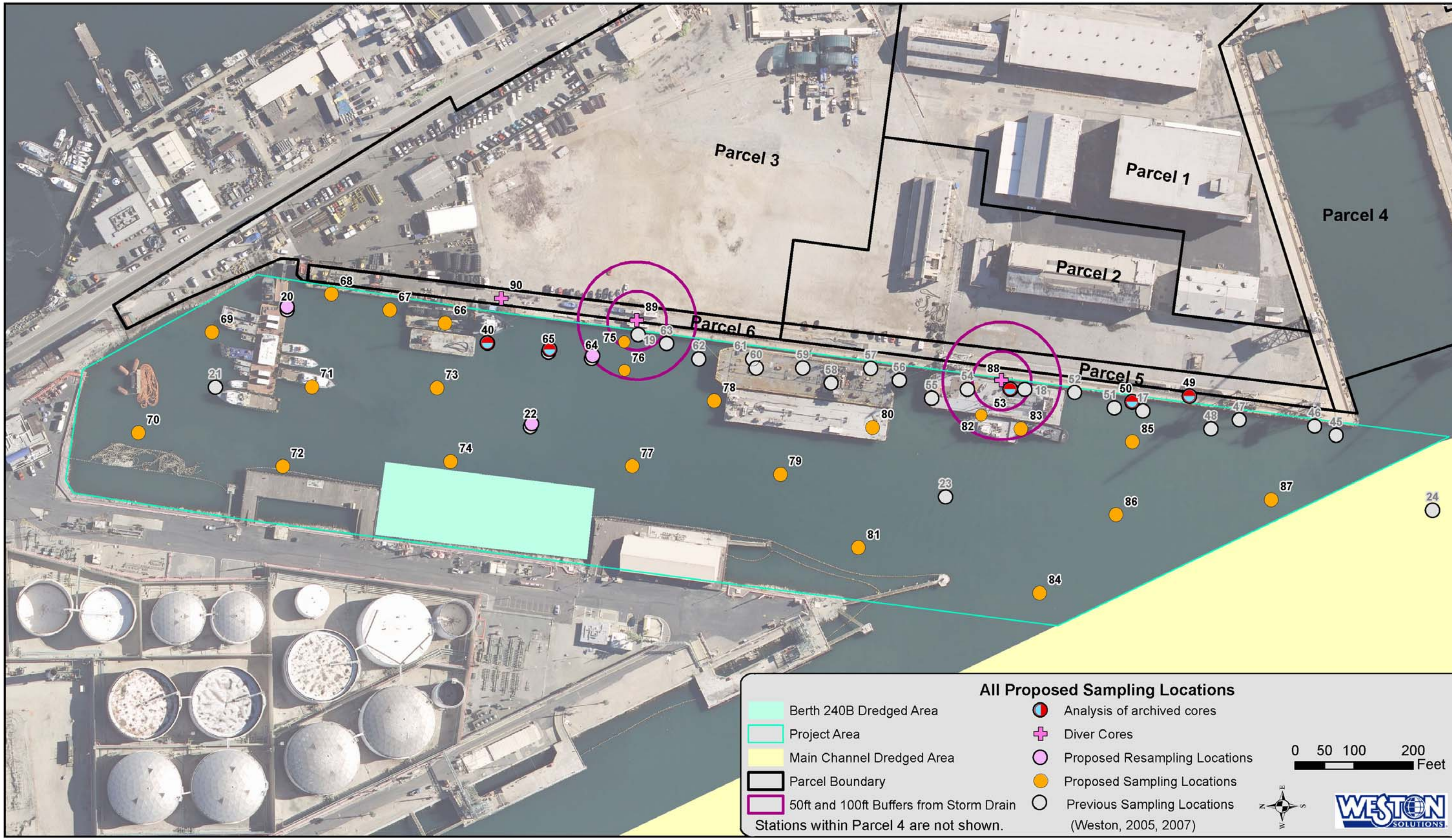


Figure 9. All Proposed Station Locations Adjacent to Berths 240 X, Y, and Z, Port of Los Angeles

Figure 10. Wharf Extending Out Over the Water Along Berths 240X, Y, and Z

1.5 Project Management and Team Responsibilities

1.5.1 Project Management

Ms. Kathryn Curtis will be the POLA Project Manager for the sediment investigation. Dr. David Moore of WESTON will serve as the overall Project Manager for the consultant team. He will coordinate the efforts of the various team members, respond to requests, and provide technical consulting and coordination with POLA and its consultants to ensure that project goals, budgets, and schedules are met. Mr. Andrew Martin of WESTON will serve as Assistant Project Manager and provide day to day technical oversight of the project. Mr. Brian Riley of WESTON will serve as the Field Operations Project Manager. He will assist Mr. Martin in coordinating team efforts and will provide oversight for all field activities. Ms. Sheila Holt of WESTON will serve as the quality assurance/quality control (QA/QC) officer and will be responsible for adherence to QA/QC requirements specified for collection, handling, and analyses. Ms. Holt will provide QA/QC review of all chemical data and interact with the analytical laboratories. Additional point-of-contact information for POLA and participating team member laboratories is provided in Appendix B.

1.5.2 Team Responsibilities

WESTON will provide field sampling equipment, coordinate field logistics with POLA, and conduct the field sampling. Seaventures will provide the sampling vessel for vibracoring operations. Analytical chemistry for sediment will be provided by Calscience Environmental Laboratories, Inc. of Garden Grove, California. WESTON laboratories in Carlsbad, California will perform toxicity testing, benthic infaunal assessments, and grain size analysis. WESTON will review all analytical data and perform all data analyses. WESTON will produce the final reports with review and approval by POLA.

2.0 MATERIALS AND METHODS

2.1 Field Collection Program for Vertical and Horizontal Delineation of Sediment Chemical Concentrations

The sampling design involves collecting sediment core samples at up to 33 stations in the vicinity of Berths 240X, Y, and Z (Figure 9). Up to 29 stations will be sampled using a vibracore and three stations will be sampled using diver collected push cores.

2.1.1 Station Locations and Depths

With the exception of station SWM64, vibracore samples will be collected to a depth of 15 ft below the sediment surface at up to 33 locations in the vicinity of Berths 240X, Y, and Z (Figure 1). At station SWM64, a vibracore sample will be collected to 20 ft below the sediment surface. Diver core samples will be collected to a depth of 2 ft below the sediment surface (or the maximum depth achievable) at three stations along Berths 240X, Y, and Z (Figure 1). The station identification (ID), latitude and longitude coordinates, and target core lengths are provided in Table 2.

Table 2. Station ID, Latitude and Longitude Coordinates, and Target Core Lengths for Subsurface Samples Collected in the Vicinity of Berths 240X, Y, and Z

Station ID	Description	Latitude (WGS 84)	Longitude (WGS 84)	Target Core Length (ft)
SWM20	Resample for Contaminant Delineation at 6-8 ft	33.735200	-118.270634	15
SWM22	Resample for Contaminant Delineation at 5-7 ft	33.734060	-118.271282	15
SWM40	Analysis of 10-12 ft Archived Core Horizon (or Resample)	33.731840	-118.271094	NA (15)
SWM49	Analysis of 8-10 ft, 10-12 ft Archived Core Horizon (or Resample)	33.731272	-118.271161	NA (15)
SWM50	Analysis of 8-10 ft, 10-12 ft Archived Core Horizon (or Resample)	33.731006	-118.271130	NA (15)
SWM53	Analysis of 10-12 ft Archived Core Horizon (or Resample)	33.734273	-118.270844	NA (15)
SWM64	Resample for Contaminant Delineation at 12-14 ft	33.733778	-118.270902	20
SWM65	Analysis of 10-12 ft Archived Core Horizon (or Resample)	33.733979	-118.270867	NA (15)
SWM66	Data Gap	33.734471	-118.270734	15
SWM67	Data Gap	33.734728	-118.270662	15
SWM68	Data Gap	33.734999	-118.270574	15
SWM69	Data Gap	33.735555	-118.270789	15
SWM70	Data Gap	33.735897	-118.271351	15
SWM71	Data Gap	33.735088	-118.271092	15
SWM72	Data Gap	33.735224	-118.271535	2
SWM73	Data Gap	33.734507	-118.271096	15
SWM74	Data Gap	33.734443	-118.271505	15
SWM75	Data Gap/Surface Core w/i 50ft of Storm Drain	33.733637	-118.270837	15
SWM76	Data Gap/Surface Core w/i 100ft of Storm Drain	33.733590	-118.271026	15

Table 2. Station ID, Latitude and Longitude Coordinates, and Target Core Lengths for Subsurface Samples Collected in the Vicinity of Berths 240X, Y, and Z

Station ID	Description	Latitude (WGS 84)	Longitude (WGS 84)	Target Core Length (ft)
SWM77	Data Gap/Surface Core w/i 100ft of Storm Drain	33.733597	-118.271529	15
SWM78	Data Gap	33.733217	-118.271162	2
SWM79	Data Gap	33.732908	-118.271572	15
SWM80	Data Gap	33.732480	-118.271309	15
SWM81	Data Gap	33.732544	-118.271980	15
SWM82	Data Gap	33.731973	-118.271239	2
SWM83	Data Gap/Surface Core w/i 100ft of Storm Drain	33.731789	-118.271315	15
SWM84	Data Gap	33.731699	-118.272230	15
SWM85	Data Gap	33.731269	-118.271386	15
SWM86	Data Gap	33.731344	-118.271792	15
SWM87	Data Gap	33.730622	-118.271706	15
SWM88	Diver Core Under Wharf	33.731880	-118.271043	2
SWM89	Diver Core Under Wharf	33.733578	-118.270714	2
SWM90	Diver Core Under Wharf	33.734209	-118.270594	2

One core per location will be sufficient to ensure an adequate volume of material (~ 2 liters [L]) for all required testing and archival. The cores will be split into vertical segments to assess the vertical resolution of potential chemical contamination. At all vibracore stations, cores will be segmented into two-foot sections (i.e., 0-2 ft, 2-4 ft, 4-6 ft, etc.) to a depth of 15 ft (or 20 ft for SWM 64 only) below the sediment surface (the bottom segment will only be one-foot in length [14-15 ft core segment]). Samples from each vertical segment will be analyzed separately according to the phased approach discussed in Section 2.4.1. At all diver core stations, only surface sediment (0-2 ft) will be collected and analyzed.

2.1.2 Navigation

All subsurface sediment station locations will be pre-plotted (Table 2). Locations will be determined using a Furano GP 1650D Differential Global Positioning System (DGPS). The system uses U.S. Coast Guard differential correction data, and is accurate within 10 ft. In the event of differential failure, stations will be located using a land surveying system, or laser range finder and visual lineups. All final station locations will be recorded in the field using positions from the DGPS or through lineups on the field map.

2.1.3 Sediment Collection and Handling

Cores will be collected in all areas accessible by boat using an electric vibracore (Figure 11). The vibracore will be deployed from the *M/V Early Bird II*, a vessel modified for environmental sampling and owned and operated by Seaventures. The vibracore will be equipped with a 4-inch outer diameter aluminum barrel and stainless steel catcher to retain sediment. The standard system is capable of collecting cores up to ~20 ft long and can be equipped to handle greater depths, up to an additional 10 ft, which is more than sufficient to cover the target core lengths identified in this project (Table 2). A new polyethylene liner will be inserted into the tube prior to sampling at each station to eliminate the possibility of cross contamination between stations. Following sampling, the vibracore will be retrieved to the deck of the boat and the liner with sediment core removed from the aluminum tube and placed in a core tray for processing. The liner will then be cut vertically along the length of the sediment core and a qualified scientist will examine and classify the sediment as well as photograph the sediment core. The core stratigraphy, sediment grain size distribution, color, texture, and other pertinent sediment characteristics will be logged according to the Unified Soil Classification System (USCS). Examples of the field log sheets are presented in Appendix C.

Sediment vibracore samples will be collected to the target sampling depth unless refusal is encountered. Refusal is defined as less than 2 inches of penetration per minute. If refusal is encountered, the vessel will be moved and a second core attempted. If refusal is encountered again, additional cores will not be attempted unless operational problems are suspected.

Diver collected push cores will be collected in areas inaccessible by boat. This includes three sample locations directly under the wharf or at the base of the crushed rock along the wharf face. Divers will use self-contained underwater breathing apparatuses (SCUBA) to access the sampling stations. Cores will be collected using a new 3-inch outer diameter polyethylene core tube. The core tube will be advanced to at least 2 ft below the mudline (unless refusal is encountered) and then sealed with end caps. Following sampling, the diver core will be retrieved to the deck of the boat and placed vertically in a rack. The core will be secured and labeled. Each end cap will be secured with duct tape. Once the sediment has settled within the core tube (approximately 20 minutes), the core length will be measured and any apparent sediment characteristics logged. Water overlying the sediment within the core tube will be drained by drilling a hole in the tube 1-cm above the water/sediment interface.

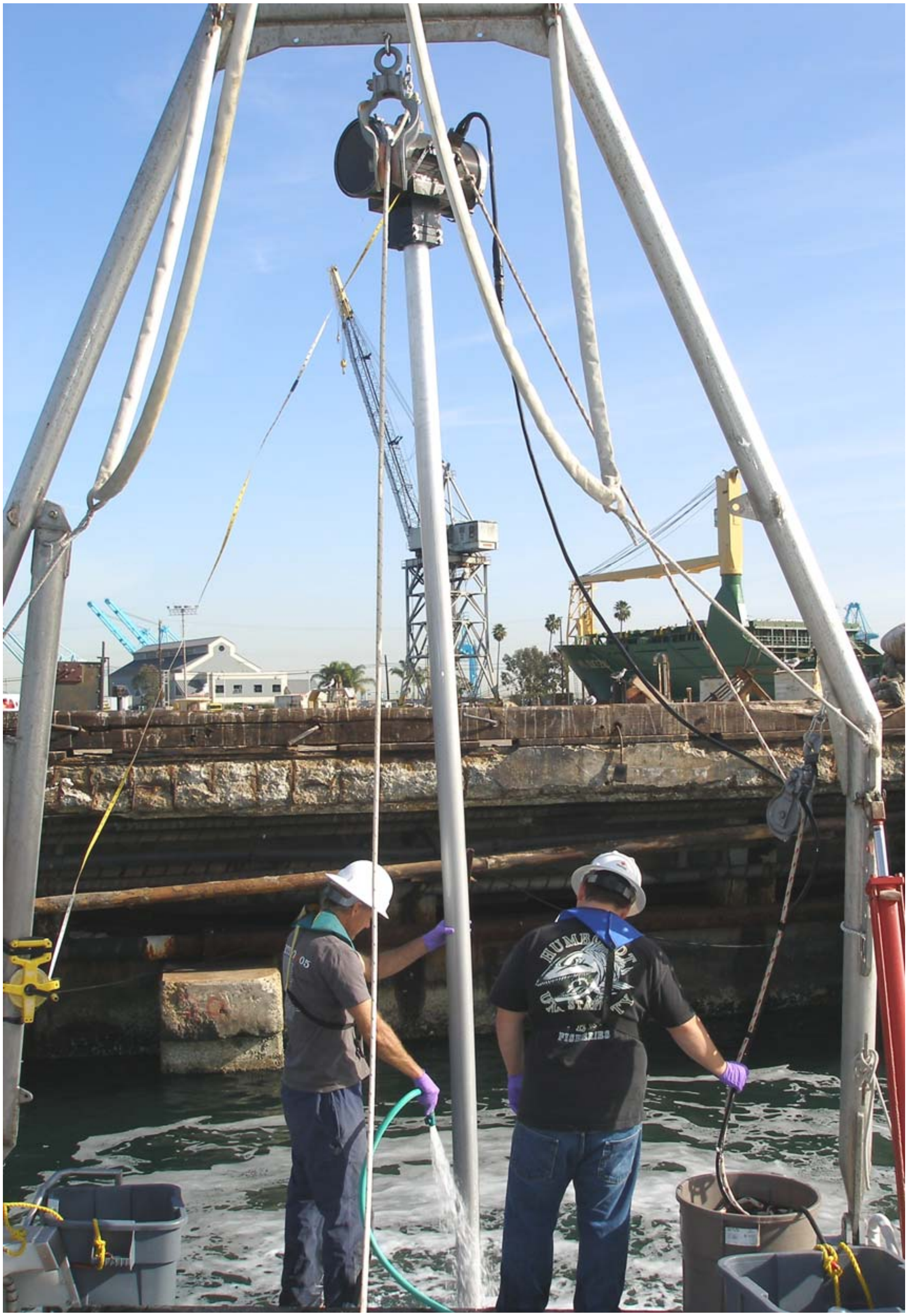


Figure 11. Vibracore Sampling along Berths 240X, Y, and Z, Port of Los Angeles

2.1.4 Sample Processing and Storage

All cores will be processed on-site on the sampling vessel. Sediment cores from each station will be sectioned into 2 ft intervals. Each 2 ft core segment will be homogenized to a uniform consistency using a stainless steel mixing apparatus. Sub-samples representing each 2 ft segment will be placed in two certified-clean 250 milliliter (mL) glass jars with Teflon-lined lids for chemical analysis and archival. Another sub-sample representing each 2 ft segment will be placed in a Ziploc™ bag for grain size analysis. Core segments not immediately analyzed in Phase I will be archived in the event that further delineation of chemical contamination is required (see discussion on the phased approach to analysis in Section 2.4.1). All samples will be labeled (project name, date, sampler ID, analysis, and preservative where applicable), logged into a field chain-of-custody (COC) form (Appendix D), and placed into a cooler. Samples will be stored in the dark on ice or at 4 degrees Celsius (°C) until shipped or delivered to the appropriate analytical laboratory. Upon delivery to the appropriate laboratory, archived samples will be frozen.

2.1.5 Decontamination of Field Equipment

All vibracore equipment will be cleaned prior to sampling. Between stations, core barrels and the deck of the vessel will be rinsed with site water and new polyethylene core tube liners will be used at each sample location. Before homogenizing each core segment, all stainless steel utensils (stainless steel bowls, spoons, spatulas, mixers, and other utensils) will be cleaned with soapy water, rinsed with tap water, and then rinsed three times with deionized water.

2.2 Shipping

Prior to shipping or delivery, chemistry samples will be securely packed inside coolers with ice. COC forms will be filled out (see Section 2.3), and the original signed COC forms will be inserted in a sealable plastic bag and placed inside the cooler. The cooler lids will be securely taped shut. Samples will be shipped or delivered to the analytical laboratories listed in Table 3.

Table 3. Analytical Laboratories, Point-of-Contact Information, and Shipping Information

Laboratory	Analyses Performed	Point-of-Contact	Shipping Information
Weston Solutions, Inc. Carlsbad, CA	Grain size, archival	Mr. Andrew Martin Ms. Sheila Holt (760) 795-6901	Weston Solutions, Inc. 2433 Impala Dr. Carlsbad, CA 92010
Calscience Environmental Laboratories, Inc.	Sediment chemistry	Ms. Danielle Gonsman (714) 895-5494 ext. 232	Calscience Environmental Laboratories, Inc. 7440 Lincoln Way Garden Grove, CA 92841

2.3 Documentation of Chain-of-Custody

This section describes the program requirements for sample handling and COC procedures. Samples are considered to be in custody if they are: (1) in the custodian's possession or view, (2) retained in a secured place (under lock) with restricted access, or (3) placed in a secured container. The principal documents used to identify samples and to document possession are COC records, field log books, and field tracking forms. COC procedures will be used for all samples throughout the collection, transport, and analytical process, and for all data and data documentation, whether in hard copy or electronic format.

COC procedures will be initiated during sample collection. A COC record will be provided with each sample or sample group (sample form provided in Appendix D). Each person who has custody of the samples will sign the form and ensure that the samples are not left unattended unless properly secured. Minimum documentation of sample handling and custody will include the following:

- Sample identification
- Sample collection date and time
- Any special notations on sample characteristics
- Initials of the person collecting the sample
- Date the sample was sent to the laboratory
- Shipping company and waybill information

The completed COC form will be placed in a sealable plastic envelope that will travel inside the ice chest containing the listed samples. The COC form will be signed by the person transferring custody of the samples. The condition of the samples will be recorded by the receiver. COC records will be included in the final analytical report prepared by the laboratory, and will be considered an integral part of that report.

2.4 Physical and Chemical Analyses

2.4.1 Phased Analytical Approach for Delineation of Sediment Chemical Contamination

Physical and chemical analyses of core samples will be conducted in a phased approach. The intent of this method is to improve efficiency by screening initial results to establish the extent of additional physical and chemical analyses required to fully delineate potential extent and magnitude of contamination. The phased analytical approaches for each sample type (i.e., data gap stations, previously sampled stations, stations near storm drain outfalls, and stations under the wharf) are described below.

2.4.1.1 Data Gaps

Physical and chemical analyses of data gap samples will be conducted in a phased approach as depicted in Table 4. The first phase consists of analyzing the 0-2 ft (surface) and 4-6 ft core segments of all stations. Results will be evaluated in accordance with Sediment Quality Objective (SQO) procedures using the California Logistic Regression Model (CA LRM) and the Chemical Score Index (CSI) to determine a final chemistry line of evidence (LOE) category. Phase II consists of two separate scenarios. In the first scenario (Phase IIa), core segment 2-4 ft will be analyzed if sediment contaminant concentrations result in a sediment chemistry LOE category of moderate or high exposure in the 0-2 ft core segment but not in the 4-6 ft core segment. In the second scenario (Phase IIb), core segment 6-8 ft will be analyzed if sediment contaminant concentrations result in a sediment chemistry LOE category of moderate or high exposure in the 4-6 ft core segment. No additional core segments will be analyzed if both the 0-2 ft and 4-6 ft core segments result in categories of minimal or low exposure. A third phase may be implemented if results from Phase IIb indicate that additional sediment characterization is warranted. Consultation with POLA regarding the extent of Phase III will be conducted prior to the initiation of Phase III analyses, which will involve analysis of 8 ft+ core horizons to the depths at which contaminants no longer result in sediment chemistry LOE categories of minimal or low exposure.

Table 4. Phased Approach to Physical and Chemical Analyses for Individual Core Segments Collected in Areas of Data Gaps

Core Segment (ft)	Phased Analyses
0 - 2	
2 - 4	
4 – 6	
6 – 8	
8 +	

	Phase I	Initial analyses
	Phase IIa	If sediment chemistry LOE category of moderate or high exposure in the 0-2 ft segment and not in 4-6 ft segment
	Phase IIb	If sediment chemistry LOE category of moderate or high exposure in the 4-6 ft segment
	Phase III	If necessary, after consultation

2.4.1.2 Previously Sampled Stations

Physical and chemical analyses of previously sampled stations will be conducted in a phased approach as depicted in Table 5. For stations SWM40, SWM53, and SWM65, the first phase consists of analyzing the 10-12 ft core segment. If sediment contaminant concentrations result in a sediment chemistry LOE category of moderate or high exposure in the 10-12 ft core segment, then the 12-14 ft core segment will be analyzed in the second phase. No additional core segments will be analyzed if contaminant concentrations in the 10-12 ft core segment result in a category of minimal or low exposure. A third phase (analysis of > 14 ft) may be implemented if results of Phase II infer additional sediment characterization is warranted. Consultation with POLA will be conducted prior to the initiation of Phase III analyses.

For stations SWM49 and SWM50, the first phase consists of analyzing the 8-10 ft core segment. If sediment contaminant concentrations result in a sediment chemistry LOE category of moderate or high exposure in the 8-10 ft core segment, then the 10-12 ft core segment will be analyzed in the second phase. No additional core segments will be analyzed if contaminant concentrations in the 8-10 ft core segment result in a category of minimal or low exposure.

For stations SWM20 and SWM22, the first phase consists of analyzing the 6-8 ft and 5-7 ft core segments, respectively, based on elevated chemistry in previous testing. If sediment contaminant concentrations result in a sediment chemistry LOE category of moderate or high exposure in the 6-8 ft and/or 5-7 ft core segments, then the 8-10 ft and/or 7-9 ft core segments will be analyzed in the second phase. No additional core segments will be analyzed if contaminant concentrations in the 6-8 ft and/or 5-7 ft core segments result in a category of minimal or low exposure. A third phase (>9 ft) may be implemented if results of Phase II infer additional sediment characterization is warranted. Consultation with POLA will be conducted prior to the initiation of Phase III analyses.

For station SWM64, the first phase consists of analyzing the 12-14 ft core segment. If sediment contaminant concentrations result in a sediment chemistry LOE category of moderate or high exposure in the 12-14 ft core segment, then the 14-16 ft core segment will be analyzed in the second phase. No additional core segments will be analyzed if contaminant concentrations in the 12-14 ft core segment result in a category of minimal or low exposure. A third phase (>14 ft) may be implemented if results of Phase II infer additional sediment characterization is warranted. Consultation with POLA will be conducted prior to the initiation of Phase III analyses.

Table 5. Phased Approach to Physical and Chemical Analyses for Further Delineation of Contamination in Previously Sampled Stations

Core Segment (ft)	Phased Analyses for SWM40, SWM53, and SWM65	Phased Analyses for SWM49 and SWM50	Phased Analyses for SWM20 and SWM22*	Phased Analyses for SWM64
6 - 8	NA	NA		NA
8 - 10	NA			NA
10 - 12				NA
12 – 14		NA	NA	
14 – 15/16		NA	NA	
>16 ft				

*For Station SWM22, phase I consists of analyzing the 5-7 ft core segment, phase II consists of analyzing the 7-9 ft core segment, and phase III consists of analyzing the 9-11 ft core segment.

	Phase I	Initial analyses
	Phase II	If sediment chemistry LOE category of moderate or high exposure in Phase I
	Phase III	If necessary, after consultation
NA	Not Analyzed	Analysis will not be conducted based on previous chemical results from 2007.

2.4.1.3 Stations Near Storm Drain Outfalls

Physical and chemical analyses of stations near storm drains were designed to link surface sediment concentrations to landside contamination; therefore, the first phase consists of analyzing the 0-2 ft (surface) core segment. Additional phases will only be implemented if results from Phase I infer additional sediment characterization is warranted. Consultation with POLA will be conducted prior to the initiation of additional phases.

2.4.1.4 Stations Under the Wharf

For diver collected cores in areas under the wharf or at the edge of the crushed stone under the wharf, only surface (0-2 ft) samples will be collected and chemically analyzed.

2.4.2 Physical Analyses

Physical analyses of the surface and subsurface sediment will include grain size and total solids (Table 6). Grain size is analyzed to determine the general size classes that make up the sediment (e.g., gravel, sand, silt, and clay). The frequency distribution of the size ranges (reported in millimeters [mm]) of the sediment will be reported in the final data report. Grain size will be conducted using the gravimetric procedure described in Plumb (1981). Total solids will be measured to convert concentrations of the chemical parameters from a wet-weight to a dry-weight basis. Total solids will be determined by Standard Method (SM) 2540B (American Public Health Association [APHA], 1998).

2.4.3 Chemical Analyses

Chemical parameters measured in this testing program were selected to provide data on potential chemicals of concern in surface and subsurface sediments along Berths 240X, Y, and Z. All analytical methods used to obtain contaminant concentrations will follow USEPA or SM procedures. Specific sediment analyses and target detection limits are specified in Table 6.

The analysis for priority pollutant metals (except mercury) will be conducted using inductively coupled plasma/mass spectrometry (ICP/MS), in accordance with USEPA 6020. Mercury analysis will be conducted using cold vapor atomic absorption spectrometry (CVAAS), in accordance with USEPA 7471A. PAHs will be analyzed using gas chromatography/mass spectrometry (GC/MS) with selective ion monitoring (SIM) in accordance with USEPA 8270C.

TOC, made up of volatile and nonvolatile organic compounds, will be determined using the Lloyd Kahn method (USEPA Region II, 1988). This procedure involves treating sediment with hydrochloric or sulfuric acid to dissolve inorganic carbon (carbonates and bicarbonates) prior to TOC analysis using USEPA 9060A. Organochlorine pesticides will be analyzed using gas chromatography/electron capture detection (GC/ECD) according to USEPA 8081A. PCB congeners GC/MS SIM according to USEPA Method 8270C. This method will follow serial extraction with methylene chloride and alumina and gel permeation column cleanup procedures. TBT and its derivatives will be analyzed by GC/MS according to Krone et al. (1989), following a cleanup procedure involving methylene chloride extraction and Grignard derivatization.

2.4.4 Quality Assurance/Quality Control

The QA objectives for chemical analysis conducted by the participating analytical laboratories are detailed in their Laboratory QA Manual(s). These objectives for accuracy and precision involve all aspects of the testing process, including the following:

- Methods and standard operating procedures (SOPs)
- Calibration methods and frequency
- Data analysis, validation, and reporting
- Internal QC
- Preventive maintenance
- Procedures to ensure data accuracy and completeness

Results of all laboratory QC analyses will be reported with the final data. Any QC samples that fail to meet the specified QC criteria in the methodology or quality assurance plan (QAP) will be identified and the corresponding data will be appropriately qualified in the final report. All QA/QC records for the various testing programs will be kept on file for review by regulatory agency personnel.

Table 6. Chemical and Physical Parameters, Analytical Methods, and Target Detection Limits

Parameter	Method	Procedure	Sediment Target Detection Limit (dry weight)
Physical / Conventional Tests			
Grain Size	Plumb (1981)	Sieve/Pipette	1.0%
TOC	USEPA 9060A	Combustion IR	0.02%
Total Solids	SM 2540B	Gravimetric	0.1%
Metals			
Arsenic (As)	USEPA 6020	ICP/MS	0.05 mg/kg
Cadmium (Cd)	USEPA 6020	ICP/MS	0.05 mg/kg
Chromium (Cr)	USEPA 6020	ICP/MS	0.05 mg/kg
Copper (Cu)	USEPA 6020	ICP/MS	0.05 mg/kg
Lead (Pb)	USEPA 6020	ICP/MS	0.05 mg/kg
Mercury (Hg)	USEPA 7471A	CVAAS	0.02 mg/kg
Nickel (Ni)	USEPA 6020	ICP/MS	0.05 mg/kg
Selenium (Se)	USEPA 6020	ICP/MS	0.05 mg/kg
Silver (Ag)	USEPA 6020	ICP/MS	0.05 mg/kg
Zinc (Zn)	USEPA 6020	ICP/MS	0.1 mg/kg
Organochlorine Pesticides			
2-4′ DDD	USEPA 8081A	GC/ECD	1 µg/kg
2-4′-DDE	USEPA 8081A	GC/ECD	1 µg/kg
2-4′-DDT	USEPA 8081A	GC/ECD	1 µg/kg
4-4′ DDD	USEPA 8081A	GC/ECD	1 µg/kg
4-4′-DDE	USEPA 8081A	GC/ECD	1 µg/kg
4-4′-DDT	USEPA 8081A	GC/ECD	1 µg/kg
Aldrin	USEPA 8081A	GC/ECD	1 µg/kg
α-BHC	USEPA 8081A	GC/ECD	1 µg/kg
β-BHC	USEPA 8081A	GC/ECD	1 µg/kg
δ-BHC	USEPA 8081A	GC/ECD	1 µg/kg
γ-BHC	USEPA 8081A	GC/ECD	1 µg/kg
Chlordane	USEPA 8081A	GC/ECD	5 µg/kg
Dieldrin	USEPA 8081A	GC/ECD	1 µg/kg
Endosulfan I	USEPA 8081A	GC/ECD	1 µg/kg
Endosulfan II	USEPA 8081A	GC/ECD	1 µg/kg
Endosulfan Sulfate	USEPA 8081A	GC/ECD	1 µg/kg
Endrin	USEPA 8081A	GC/ECD	1 µg/kg
Endrin Aldehyde	USEPA 8081A	GC/ECD	1 µg/kg
Endrin Ketone	USEPA 8081A	GC/ECD	1 µg/kg
Heptachlor	USEPA 8081A	GC/ECD	1 µg/kg
Heptachlor Epoxide	USEPA 8081A	GC/ECD	1 µg/kg
Methoxychlor	USEPA 8081A	GC/ECD	1 µg/kg
Toxaphene	USEPA 8081A	GC/ECD	10 µg/kg
PCBs			
PCB Congeners	USEPA 8270C	GC/MS SIM	1 µg/kg
Organotins			
Monobutyltin	Krone et al. (1989)	GC/MS	1 µg/kg
Dibutyltin	Krone et al. (1989)	GC/MS	1 µg/kg
Tetrabutyltin	Krone et al. (1989)	GC/MS	1 µg/kg
Tributyltin	Krone et al. (1989)	GC/MS	1 µg/kg
PAHs			
1-Methylnaphthalene	USEPA 8270C	GC/MS SIM	8 µg/kg
1-Methylphenanthrene	USEPA 8270C	GC/MS SIM	8 µg/kg
1,6,7-Trimethylnaphthalene	USEPA 8270C	GC/MS SIM	8 µg/kg
2,6-Dimethylnaphthalene	USEPA 8270C	GC/MS SIM	8 µg/kg
2-Methylnaphthalene	USEPA 8270C	GC/MS SIM	8 µg/kg
Acenaphthene	USEPA 8270C	GC/MS SIM	8 µg/kg
Acenaphthylene	USEPA 8270C	GC/MS SIM	8 µg/kg
Anthracene	USEPA 8270C	GC/MS SIM	8 µg/kg
Benz[a]anthracene	USEPA 8270C	GC/MS SIM	8 µg/kg
Benzo[a]pyrene	USEPA 8270C	GC/MS SIM	8 µg/kg
Benzo[b]fluoranthene	USEPA 8270C	GC/MS SIM	8 µg/kg
Benzo[e]pyrene	USEPA 8270C	GC/MS SIM	8 µg/kg
Benzo[g,h,i]perylene	USEPA 8270C	GC/MS SIM	8 µg/kg
Benzo[k]fluoranthene	USEPA 8270C	GC/MS SIM	8 µg/kg

Table 6. Chemical and Physical Parameters, Analytical Methods, and Target Detection Limits

Parameter	Method	Procedure	Sediment Target Detection Limit (dry weight)
Biphenyl	USEPA 8270C	GC/MS SIM	8 µg/kg
Chrysene	USEPA 8270C	GC/MS SIM	8 µg/kg
Dibenz[a,h]anthracene	USEPA 8270C	GC/MS SIM	8 µg/kg
Fluoranthene	USEPA 8270C	GC/MS SIM	8 µg/kg
Fluorene	USEPA 8270C	GC/MS SIM	8 µg/kg
Indeno[1,2,3-c,d]pyrene	USEPA 8270C	GC/MS SIM	8 µg/kg
Naphthalene	USEPA 8270C	GC/MS SIM	8 µg/kg
Perylene	USEPA 8270C	GC/MS SIM	8 µg/kg
Phenanthrene	USEPA 8270C	GC/MS SIM	8 µg/kg
Pyrene	USEPA 8270C	GC/MS SIM	8 µg/kg

CVAAS cold vapor atomic absorption spectrophotometry
GC/ECD gas chromatography/electron capture detection
GC/MS gas chromatography/mass spectrometry
ICP/MS inductively coupled plasma/mass spectrometry
SIM selected ion monitoring

2.5 Data Review, Management and Analysis

2.5.1 Data Review

All data will be reviewed and verified by participating team laboratories to determine whether all data quality objectives have been met, and that appropriate corrective actions have been taken, when necessary.

2.5.2 Data Management

All laboratories will supply analytical results in both hard copy and electronic formats. Laboratories will have the responsibility of ensuring that both forms are accurate. After completion of the sediment data review by participating team laboratories, hard copy results will be placed in the project file at WESTON and the results in electronic format will be imported into WESTON’s database system.

2.5.3 Data Analysis

Chemical contamination of subsurface sediments along Berths 240X, Y, and Z will be assessed using two methods, the CSI and CA LRM.

2.6 Reporting

2.6.1 Draft and Final Reports

After all results are received, statistical analyses completed and evaluations made, WESTON will prepare draft and final reports. These will include summaries of all activities associated with collecting, compositing, transporting, and analyzing sediment samples. The chemical and physical data reports will be included as appendices. At a minimum, the following will be included in the final report:

- Summary of all field activities, including a description of any deviations from the approved SAP
- Descriptions of each sample and all original core collection logs
- Locations of sediment sampling stations, reported in latitude and longitude (decimal degrees) World Geodetic System 1984 (WGS 84)
- Plan view of the project showing the actual station locations

- Final QA/QC report, as described in Section 2.6.2
- Data Results. In addition to hard copies of field data, laboratory analysis results, and associated QA/QC data, electronic copies for all data will be stored at WESTON

2.6.2 Quality Assurance/Quality Control and Laboratory Data Report

Analytical laboratories will provide a QA/QC narrative that describes the results of the standard QA/QC protocols that accompany analysis of field samples. WESTON's QAP details these protocols. All hard copies of results will be maintained in the project file at WESTON in Carlsbad and included in the final report. In addition, back-up copies of results generated by each laboratory will be maintained at their respective facilities. At a minimum, the laboratory reports will contain results of the laboratory analysis, QA/QC results, all protocols and any deviations from the project SAP and QAP, and a case narrative of COC details.

2.7 Schedule

Scheduling of proposed activities will be dependent on final approval of the SAP and vessel availability. Once initiated, field sampling activities are anticipated to take approximately four days. Upon completion of the field sampling effort, chemical analysis (Phase I and II) of sediment will be completed in approximately two months. Upon completion of Phase I and II chemical analysis, POLA will be consulted to determine if additional sediment characterization is necessary. If necessary, Phase III chemical analysis will be completed in approximately four weeks after consultation with POLA. Once all data have been collected and undergone QA/QC review, a draft report will be prepared within six weeks. Upon receipt of comments from POLA, the CSTF, and the DTSC, a final report will be prepared within approximately one month. A detailed schedule will be developed after final approval of the SAP.

3.0 REFERENCES

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Appendix A
Maps of Sample Density and Placement Determination Using Visual Sampling Plan Software

Figure A-1. Sample density and placement determination using Visual Sampling Plan software, assuming placement along a systematic triangular grid, and a probability of 95% of detecting hot spot representing 5% of the area to be sampled

Figure A-2. Sample density and placement determination using Visual Sampling Plan software, assuming placement along a systematic triangular grid and a probability of 95% of detecting hot spot representing 7.5% of the area to be sampled.

Appendix B
Point-of-Contact Information

Table B-1: Point-of-Contact Information

Organization	Point-of-Contact	Address	Phone/FAX	E-mail
POLA	Ms. Kathryn Curtis	Port of Los Angeles 425 S. Palos Verdes Street San Pedro, California 90731	(310) 732-3681 (310) 547-4643	kcurtis@portla.org
Weston Solutions, Inc.	Dr. David Moore Mr. Andrew Martin	Weston Solutions 2433 Impala Drive Carlsbad, CA 92010	(760) 795-6901 (760) 931-1580	david.moore@westonsolutions.com wendy.hovel@westonsolutions.com
Calscience	Ms. Danielle Gonsman	Calscience Environmental Laboratories, Inc. 7440 Lincoln Way Garden Grove, CA 92841	(714) 895-5494 (714) 894-7501	dgonsman@calscience.com

Appendix C
Field Logs

WESTON SOLUTIONS

VIBRACORE SEDIMENT CORING LOG

PROJECT/SURVEY	DATE	PROJECT MANAGER	RECORDER

STATION ID	NAV DATUM	LATITUDE	LONGITUDE
	WGS84		
WATER DEPTH (FT)	TIDE (FT)	MLLW (FT) = WATER DEPTH - TIDE	SAP DEPTH (FT)
TARGET CORE LENGTH (FT) (SAP DEPTH - MLLW)	FINAL CORE LENGTH (FT)	PENETRATION (FT)	CORE LENGTH COLLECTED FOR ANALYSIS (FT)
CORE DIAMETER (IN)	ATTEMPT	TIME STARTED	TIME FINISHED
4	of		

PEN. DEP.(FT)	RETRV. DEP.(FT)	SEDIMENT TYPE	ODOR	COLOR (HUE_VALUE/CHROMA)	SAMPLE ID BY DEPTH	MISC
1	1					
2	2					
3	3					
4	4					
5	5					
6	6					
7	7					
8	8					
9	9					
10	10					
11	11					
12	12					

NOTES

Appendix D
Chain-of-Custody Form

WESTON SOLUTIONS®

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☐ 1440 Broadway, Ste. 910 • Oakland, CA 94612 • (510) 808-0302, FAX 891-9710

CHAIN OF CUSTODY

1760

DATE_______________ PAGE_____ OF_____

PROJECT NAME / SURVEY / PROJECT NUMBER

PROJECT MANAGER / CONTACT

COMPANY / CLIENT

ADDRESS

PHONE / FAX / EMAIL

SITE ID (Location)	SAMPLE ID	DATE	TIME	MATRIX	CONTAINER TYPE / VOLUME	TOTAL NUMBER OF CONTAINER	ANALYSIS/TEST REQUESTED								PRESERVED HOW	FOR WESTON USE ONLY: SAMPLE TEMP. (°C) UPON RECEIPT	WESTON LAB ID

Sample Matrix Codes: FW= fresh water GW=ground water SLT=salt water SW=storm water WW=waste water SED=sediment A=air BIO=biologic SS=soil T=tissue O=other (specify) ______________

Container Code: G=glass P=plastic B=bags ☐ O=other ______________

Shipped By: ☐ Courier ☐ UPS ☐ FedEx ☐ USPS ☐ Client drop off ☐ Other ______________

Turnaround Time: ☐ 2-day ☐ 5-day ☐ 7-day ☐ 10-day ☐ 14-day ☐ Standard ☐ Other ______________

Reporting Requirements: ☐ PDF ☐ EDD ☐ Hard Copy ☐ Email ☐ Other ______________

SAMPLED BY: **PRINT** **SIGNATURE**

COMMENTS / SPECIAL INSTRUCTIONS

RELINQUISHED BY				RECEIVED BY			
Print Name	**Signature**	**Firm**	**Date/Time**	**Print Name**	**Signature**	**Firm**	**Date/Time**
1.							
2.							
3.							
4.							
5.							
6.							

WHITE – return to originator • YELLOW – lab • PINK – retained by originator